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MWEB-002

1 This application is submitted in the name of the fol-
2 lowing inventor:

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7
8 The assignee is MagicWeb Communications, Inc., a Cali-
9 fornia corporation having an office at 894 Ross Drive, Suite 200,
10 Sunnyvale, CA 94089.

11
12 **Title of the Invention**

13
14 Dynamic Downloading of Hypertext Electronic Mail Messages
15

16 **Background of the Invention**

17
18 **1. Field of the Invention**

19
20 This invention relates to dynamic downloading of hyper-
21 text electronic mail messages.
22

23
24 **2. Description of Related Art**

25 Electronic mail is a technique in which messages are
26 composed by a sender, sent from a sending computer, received and
27 stored at a receiving computer, and ultimately presented to a re-
28 cipient; the sending computer and the receiving computer may be
29

1 the same computer, or may be different computers which are cou-
2 pled together using a computer network or other communication
3 link. For example, an operator may use a workstation for compos-
4 ing electronic mail messages and to couple that workstation to
5 the sending computer for sending those electronic mail messages,
6 and to couple the workstation to the receiving computer for re-
7 ceiving electronic mail messages and to use the workstation for
8 reviewing those electronic mail messages.

9
10 One problem which has arisen in the art is that it can
11 take substantial time to transmit an electronic mail message from
12 the workstation to the sending computer (herein called
13 "uploading" the message) or to transmit an electronic mail mes-
14 sage from the receiving computer to the workstation (herein
15 called "downloading" the message). This problem is particularly
16 acute when the electronic mail message is laden with data or
17 graphics, when the communication link (between the workstation
18 and the sending computer or between the workstation and the re-
19 ceiving computer) has relatively low communication bandwidth, or
20 when there are many electronic mail messages to be transmitted.
21 The operator of the workstation perceives substantial transmis-
22 sion time as excessive latency in uploading or downloading elec-
23 tronic mail messages.

24
25 One method has been to transmit only a part of the
26 electronic mail message for presentation to the operator, such as
27 a header for the message or a first screen display for the mes-
28 sage, and to require the operator to request more of the elec-
29 tronic mail message before the remainder is transmitted for pres-

1 entation. Although this method allows the operator to review at
2 least part of the electronic mail message relatively quickly, it
3 suffers from the drawback that the operator must be present at
4 the workstation to request further information and thus to cause
5 the electronic mail message to be fully transmitted for presenta-
6 tion.

7
8 A variant of this method is to transmit the entire
9 electronic mail message for immediate presentation to the opera-
10 tor, but to allow the operator to interrupt the transfer, such as
11 with a flow control character, if it is desired to perform an-
12 other task. Although this method also allows the operator to re-
13 view at least part of the electronic mail message relatively
14 quickly, it suffers from the drawback that the operator must re-
15 view only a single electronic mail message at a time, and there-
16 fore must wait the full latency for downloading a first elec-
17 tronic mail message before reviewing any part of a second elec-
18 tronic mail message.

19
20 An aspect of the problem which has arisen in the art is
21 that electronic mail messages are linear sequences of characters,
22 while it is often desirable to transmit information which is or-
23 ganized other than linearly. For example, it is often desirable
24 to transmit information organized as hypertext, such as informa-
25 tion presented using HTML (hypertext markup language) or related
26 description languages, and capable of being transmitted using the
27 HTTP (hypertext transfer protocol) or related protocols. When
28 information is so organized, presenting information in the elec-
29 tronic mail message in the order it is transmitted will often be

1 contrary to the purposes of the both the sender and recipient.
2 Rather, the operator will wish to review portions of the elec-
3 tronic mail message in a different order from the order it is
4 transmitted by the sender to the recipient.

5
6 Accordingly, it would be advantageous to provide a tec-
7 nique for downloading electronic mail messages which allows an
8 operator to review at least portions of those electronic mail
9 messages without waiting to download the entire electronic mail
10 message. This advantage is achieved by a method and system ac-
11 cording to the present invention in which electronic mail mes-
12 sages and portions thereof are presented to an operator at a
13 workstation while other electronic mail messages or other por-
14 tions of the same electronic mail message are dynamically down-
15 loaded in one or more background tasks and held in storage for
16 later presentation.

17 18 **Summary of the Invention** 19

20 The invention provides a method and system for dynamic
21 downloading of hypertext electronic mail messages. The system
22 includes a mail server for receiving electronic mail messages and
23 their headers, and a mail client for downloading electronic mail
24 messages and their headers from the mail receiver and presenting
25 downloaded electronic mail messages and headers to an operator.
26 The mail client dynamically downloads and presents electronic
27 mail messages responsive to interactive instructions from an op-
28 erator, downloads and stores electronic mail messages for subse-
29

1 quent presentation to the operator, and organizes electronic mail
2 messages in hypertext sections for selection by and presentation
3 to the operator.

4
5 In preferred embodiments, the mail server and the mail
6 client cooperate dynamically and interactively to download, so as
7 to present to the operator, electronic mail messages, or portions
8 thereof, linked by hypertext links and possibly including data,
9 audiovisual material, included programs, security features, or
10 other features in addition to text.

11 12 **Brief Description of the Drawings**

13
14 Figure 1 shows a system for accessing electronic mail
15 messages.

16 17 **Description of the Preferred Embodiment**

18
19 Embodiments of this invention may be used together with
20 inventions described in the following co-pending application,
21 hereby incorporated by reference as if fully set forth herein:

- 22
23 o Application Serial No. _____, filed July ____, 1996,
24 in the name of inventor Julien T. Nguyen, titled "Dynamic
25 Preloading of Web Pages", attorney docket number MWEB-001,
26 assigned to the same assignee.
27
28
29

1 In the following description, a preferred embodiment of
2 the invention is described with regard to preferred process steps
3 and data structures. However, those skilled in the art would
4 recognize, after perusal of this application, that embodiments of
5 the invention may be implemented using a general purpose proces-
6 sor, and that modification of a general purpose processor to im-
7 plement the process steps and data structures described herein
8 would not require undue invention.

10 SYSTEM FOR ACCESSING ELECTRONIC MAIL MESSAGES

11
12 Figure 1 shows a system for accessing electronic mail
13 messages.

14
15 A system 100 for accessing electronic mail messages
16 comprises a mail server 110, a communication link 120, and a mail
17 client 130.

18
19 In a preferred embodiment, the mail server 110 com-
20 prises a server processor 111 and server storage 112, with the
21 processor 111 comprising at least one general purpose computer
22 having a computing element, program and data memory.

23
24 The mail server 110 is disposed for receiving elec-
25 tronic mail messages, and for generating and responding to re-
26 quests from the mail client 130 in a protocol for transmitting
27 electronic mail messages to the mail client 130. The protocol is
28 preferably the Simple Mail Transfer Protocol ("SMTP"), but the
29

1 concepts of the invention are broad enough to apply to other
2 electronic mail protocols and protocols for transferring and pre-
3 senting information.

4
5 In a preferred embodiment, the communication link 120
6 comprises a dynamic link using a network 121 (such as a local
7 area network or a wide area network) or a network of networks
8 (such as an "internet" or an "intranet"). The mail server 110 is
9 coupled to the network using a server local link 122, such as a
10 T1 line or other telephone line; similarly, the mail client 130
11 is coupled to the network using a client local link 123, such as
12 a telephone line and a modem such as an ISDN modem or a 28.8 Kbps
13 analog modem. Other techniques for coupling the mail server 110
14 and the mail client 130 to the network 121 are known in the art.

15
16 The mail client 130 similarly comprises a processor 131
17 and client storage 132, with the processor 131 comprising a gen-
18 eral purpose processor having a computing element, program and
19 data memory. In a preferred embodiment, preferred process steps
20 and data structures for the page client 130 are specified in the
21 the "Java" computer language. The general purpose processor may
22 comprise any processor disposed to interpret or to compile the
23 "Java" computer language, such as an Intel "Pentium" processor
24 operating at 90 megahertz, having 32 megabytes of program/data
25 memory, operating under control of the Microsoft "Windows 95" op-
26 erating system, and coupled to 1.0 gigabytes of client storage
27 132.

1 In a first preferred embodiment, the mail client 130
2 comprises an input element 133 and a display element 134. The
3 input element 133 comprises a keyboard and a pointing device such
4 as a mouse or trackball. The display element 134 comprises a
5 visual display element such as a monitor or a display panel, and
6 an audio display element such as a speaker.

7
8 In a second preferred embodiment, the mail client 130
9 does not include both the input element 133 and the display ele-
10 ment 134, but is disposed for coupling to devices for performing
11 those functions and which are supplied by an operator. For exam-
12 ple, the mail client 130 may comprise an input port 135 disposed
13 for coupling to the input element 133, an output port 136 dis-
14 posed for coupling to the display element 134, or both.

15
16 The operator may be a human being directing the opera-
17 tions of the mail client 130, or alternatively may be another
18 program using the mail client 130 to obtain information from the
19 mail server 110.

20 21 **DYNAMIC DOWNLOADING OF HYPERTEXT ELECTRONIC MAIL MESSAGES**

22
23 An electronic mail message 140 comprises a header 141,
24 comprising information about the electronic mail message 140, and
25 a body 142, comprising information intended to be transmitted to
26 the recipient of the electronic mail message 140.

1 In a preferred embodiment, the header 141 comprises an
2 address for a sender of the electronic mail message 140, an ad-
3 dress for at least one recipient of the message of the electronic
4 mail message 140, an element describing the subject of the elec-
5 tronic mail message 140, and an element describing the size of
6 the electronic mail message 140. In a preferred embodiment, the
7 header 141 is no more than about 250 bytes in size.

8
9 The display element 134 comprises a header window 151
10 within which information from the headers 141 is presented to the
11 operator, thus showing the number and nature of electronic mail
12 messages 140 which have been received and are available for down-
13 load.

14
15 The body 142 comprises a plurality of pages 143 of in-
16 formation to be presented to the operator, such as web pages as
17 described in the "Dynamic Preloading of Web Pages" co-pending ap-
18 plication referred to herein. The pages 143 are logically cou-
19 pled using links as described therein. Thus, each electronic
20 mail message 140 comprises a linked collection of pages 143,
21 similar to a web site stored at a web page server for the World
22 Wide Web.

23
24 In a preferred embodiment, each electronic mail message
25 140 may comprise links to actual web pages (i.e., web pages out-
26 side the collection of pages 143 comprising the electronic mail
27 message 140 itself) stored at a web server or other server for
28 accessing information. These actual web pages are accessed using
29 the Hypertext Transfer Protocol ("HTTP"), or other protocols for

1 transferring and presenting information, including protocols
2 known as "FSP", "FTP", "Gopher", and variants thereof, protocols
3 for access to a command interface such as "Telnet", "MUD",
4 "MUSH", "MOO", and variants thereof, other protocols for access-
5 ing, transmitting, or presenting information, and programs making
6 use of such protocols, such as "Archie", "Veronica", "Jughead",
7 and the like.

8
9 In a preferred embodiment, each electronic mail message
10 140 may comprise links to application programs available at the
11 mail client 130, such as using Object Linking and Embedding
12 ("OLE"), or a similar technique. For example, the electronic
13 mail message 140 may comprise an embedded spreadsheet and an OLE
14 link to a spreadsheet program for viewing or modifying the embed-
15 ded spreadsheet.

16
17 The display element 134 comprises at least one page
18 window 152, each of which presents one of the pages 143 to the
19 operator. Each page 143 is presented in like manner as web pages
20 are presented in the "Dynamic Preloading of Web Pages" co-pending
21 application referred to herein. For each page 143, data included
22 in the page 143, including text, graphics, motion picture data,
23 audio, or data in other formats, is presented to the operator
24 within the page window 152, along with any links, virtual links,
25 included programs, security restrictions, or other features de-
26 scribed in the "Dynamic Preloading of Web Pages" co-pending ap-
27 plication referred to herein.

1 It is one aspect of the invention that electronic mail
2 messages 140 are presented to the operator in like manner as web
3 pages are presented in the "Dynamic Preloading of Web Pages" co-
4 pending application referred to herein. In this aspect, the
5 header window 151 is treated similarly to a web page in which
6 each header 141 is treated similarly to a link to a first page
7 143 of its associated body 142.

8
9 Thus, the operator may select one of the headers 141 so
10 as to view its associated body 142, to which the mail client 130
11 responds by downloading that body 142 and presenting a first page
12 143 of that body 142.

13
14 Similarly to the preloading of web pages in the
15 "Dynamic Preloading of Web Pages" co-pending application referred
16 to herein, the mail client 130 downloads the associated body 142
17 for each electronic mail message 140 before its actual selection
18 by the operator, so as to be able to present pages 143 from that
19 body 142 by reference to the client storage 132 rather than hav-
20 ing to download that body 142 and force the operator to wait dur-
21 ing the download operation.

22 23 **OPERATION OF THE MAIL CLIENT** 24

25 The mail client 130 transmits a request to the mail
26 server 110, requesting transmission of the headers 141 for any
27 electronic mail messages 140 which have been received and are
28 available for downloading. In a preferred embodiment, the mail
29

1 client 130 transmits such a request when it is first invoked, at
2 periodic times, and when the operator so requests (such as by us-
3 ing a button or command character).

4
5 The mail client 130 receives headers 141 from the mail
6 server 110 and presents those headers 141 in the header window
7 151 to the operator.

8
9 Responsive to the headers 141, the mail client 130 se-
10 lects individual electronic mail messages 140 and transmits re-
11 quests to the mail server 110 to download those individual elec-
12 tronic mail messages 140. As the electronic mail messages 140
13 are downloaded, they are stored in the client storage 132. The
14 mail client 130 selects a first electronic mail message 140 and
15 presents that first electronic mail message 140 in the page win-
16 dow 152.

17
18 The mail client 130 selects for downloading and down-
19 loads individual electronic mail messages 140 in like manner as
20 web pages are selected for preloading and preloaded in the
21 "Dynamic Preloading of Web Pages" co-pending application referred
22 to herein.

23
24 Thus, in a preferred embodiment, the mail client 130
25 selects an individual electronic mail message 140 for download-
26 ing, and transmits a request to the mail server 110 to download
27 that individual electronic mail message 140.

28
29

1 When the operator selects a particular electronic mail
2 message 140 for presentation, the mail client 130 determines if
3 that particular electronic mail message 140 has been downloaded
4 and is present in the client storage 132. If so, the mail client
5 130 presents that particular electronic mail message 140 from the
6 client storage 132. If not, the mail client 130 transmits a re-
7 quest to the mail server 110 to download the newly selected elec-
8 tronic mail message 140, downloads the newly selected electronic
9 mail message 140, and presents the newly selected electronic mail
10 message 140 to the operator in the page window 152.

11
12 The selection by the operator of a particular elec-
13 tronic mail message 140 for presentation takes priority over
14 other download operations. The mail client 130 interrupts any
15 other download operation to conduct the download operation re-
16 quested by the operator. Thus, the mail client 130 may interrupt
17 downloading and presentation of the headers 141 in the header
18 window 151, downloading of a different electronic mail message
19 140 selected for downloading by the mail client 130, or even
20 downloading of a different electronic mail message 140 selected
21 for downloading by the operator (but for which the operator has
22 apparently decided is lower priority).

23
24 As the mail client 130 downloads the electronic mail
25 message 140, it presents as much as possible of the electronic
26 mail message 140 (such as a first page 143 of the electronic mail
27 message 140) to the operator for dynamic review while the down-
28 loading operation is in progress.

1 When the downloading operation for the selected elec-
2 tronic mail message 140 is complete, the mail client 130 reverts
3 to its behavior of downloading the headers 141 if they are not
4 completely downloaded, and of selecting for downloading and down-
5 loading individual electronic mail messages 140 in like manner as
6 web pages are selected for preloading and preloaded in the
7 "Dynamic Preloading of Web Pages" co-pending application referred
8 to herein.

9
10 Dynamic downloading of electronic mail messages 140
11 continues so long as there are electronic mail messages 140
12 available at the mail server 110 for which the operator is the
13 intended destination.

14 15 **PROGRESS INDICATOR**

16
17 The mail client 130 presents the progress of download-
18 ing operations using a progress indicator 151, in like manner as
19 the page client presents the progress of preloading operations
20 for web pages.

21
22 Thus, in a preferred embodiment, the progress indicator
23 151 uses one or more of the following preferred embodiments:

- 24
25 o The progress indicator 151 may include a text element or a
26 graphics element, having a first part 153 and a second part
27 154, each having different colors, and altering the relative
28 sizes of the first part 151 and the second part 152 as the
29

download operation progresses. In this embodiment, the graphics element comprises a separate dot or small circle 155 associated with the header 141; or, the text element comprises the presentation of header 141 itself.

o The progress indicator 151 may include a text element 156 or a graphics element shown outside the header window 151. In this embodiment, the text element 156 comprises a phrase such as "75% complete" for a downloading operation which was in fact 75% complete; the graphics element may comprise a thermometer graph representing the progress of the downloading operation.

o The progress indicator 151 may include a "thumbnail" picture 157 (i.e., a copy of a page 143 of the electronic mail message 140 presented in miniature), presented at a location outside the header window 151. In this embodiment, the progress indicator 151 comprises a first part 153 and a second part 154, in which the first part 153 comprises a segment of the thumbnail picture 157 which presents information from a page 143 of the electronic mail message 140 as that electronic mail message 140 downloaded, and the second part 154 comprises a background color or other indicator that further data is yet to be downloaded. Thus the thumbnail picture 157 will fill the location for its presentation as the downloading operation progresses.

ORDERING ELECTRONIC MAIL MESSAGES FOR DYNAMIC DOWNLOADING

In a preferred embodiment, the mail client 130 dynamically orders the electronic mail messages 140 for downloading, and selects those electronic mail messages 140 for downloading which the mail client 130 dynamically considers should be downloaded first.

Since the operator is likely to ultimately desire to review all the electronic mail messages 140 which are received, the mail client 130 will, unless directed otherwise by the operator, download all the electronic mail messages 140 whose headers 141 are presented by the mail server 110.

Similarly to the "Dynamic Preloading of Web Pages" co-pending application referred to herein, the mail client 130 makes its selection responsive to one or more of the following factors: (1) the operator may explicitly select a particular electronic mail message 140 for downloading (e.g., while the operator reviews a different electronic mail message 140); (2) the operator may explicitly select a set of downloading preferences and priorities.

To explicitly select a particular electronic mail message 140 for downloading, the operator selects the electronic mail message 140 for downloading using the input element 133, such as by pointing to the associated header 141 or to its preloading indicator 151 and selecting the electronic mail message 140 for downloading.

1
2 If the operator selects a particular electronic mail
3 message 140 for downloading, the selected electronic mail message
4 140 takes priority and is downloaded before other electronic mail
5 messages 140 which might be downloaded for other reasons.

6
7 When the operator explicitly selects a set of download-
8 ing preferences and priorities, the mail client 130 receives the
9 downloading preferences and their relative priorities from the
10 operator, and stores the downloading preferences and their rela-
11 tive priorities in the client storage 132. When the mail client
12 130 receives the headers 141, it reviews the downloading prefer-
13 ences and their relative priorities, and downloads those elec-
14 tronic mail messages 140 which are indicated by the downloading
15 preferences in the order of their relative priorities.

16
17 The downloading preferences select among those links
18 150 to electronic mail messages 140 responsive to one or more of
19 the following factors:

- 20
21 o the sender of the electronic mail message 140;
22
23 o whether this recipient of the electronic mail message 140 is
24 the only recipient or one of several recipients;
25
26 o a priority value set by the sender for the electronic mail
27 message 140, such as "urgent" or "bulk mail";
28
29

- 1 o keywords in the header 141 or the body 142 of the electronic
- 2 mail message 140; or
- 3
- 4 o the size of the electronic mail message 140.
- 5

SENDING ELECTRONIC MAIL MESSAGES

8 In a preferred embodiment, the mail client 130 receives
9 information from the operator to compose electronic mail messages
10 140 (either new electronic mail messages 140 or in reply to elec-
11 tronic mail messages 140 which have been received). The mail
12 client 130 presents outgoing electronic mail messages 140 which
13 are being composed in an outgoing window 153.

15 When the operator indicates that the outgoing elec-
16 tronic mail messages 140 are complete, the mail client 130 rec-
17 ords them in the client storage 132 and uploads them at the next
18 time when there is no downloading operation in progress. How-
19 ever, the operator may direct the mail client 130 (e.g., using a
20 command invoked using a button or a control character) to inter-
21 rupt any downloading operation which is in progress and to send
22 one or more of the outgoing electronic mail messages 140 immedi-
23 ately.

Alternative Embodiments

27 Although preferred embodiments are disclosed herein,
28 many variations are possible which remain within the concept,
29

1 scope, and spirit of the invention, and these variations would
2 become clear to those skilled in the art after perusal of this
3 application.

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